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EP Eurpoean patents: Austria, Belgium, Switzerland, Cyprus, Germany, Denmark, Spain, Finland, France, England, Greece, Ireland, Italy, Luxembourg, Monaco, the Netherlands, Portugal, and Sweden

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(54) [Title] METHOD AND DEVICE FOR PROVIDING ON-SCREEN DISPLAY FOR POLYCHROMATIC TELEVISION RECEIVER

Abstract
The present invention pertains to a device and method for matching the hue of images with a combining OSD graphic by regulating the hue of the on-screen display graphic. As one characteristic of the present invention, one palette selected from several OSD color palettes (103, 105) is used in generating a graphic for one signal source selected from several signal sources. In this manner, an appropriately formatted palette is used in generating a graph for a similarly formatted input signal. In other words, analog signal sources are combined with a graphic generated from a palette having Y, P_I, and P_Q format signals. As a result, a hue compensation matrix appropriately compensates all graphics and images from each signal source. As another characteristic of the present invention, one preferable matrix of several matrices (107, 109) is exerted on the OSD signal source to match the degree of OSD chromaticity with the degree of chromaticity of an input signal.

Representative figure:

Figure 3

Specification

Technical field

The present invention pertains to a device and method for processing video signals. More specifically, the present invention pertains to a device and method for processing on-screen display (OSD) signals and video signals from various signal sources having different degrees of chromaticity (colorimetry).

Background technology

Recent television receivers have been designed to receive and process video signals that are transmitted from various kinds of signal sources, for example, analog television signals from a transmission or videotape according to A/54 (1995) the standards of the National Television Standard Committee (NTSC) of the US as well as digital video signals that are transmitted according to the digital television standards of the ATSC. "Degree of chromaticity" means a matrix coefficient related to the combination of primary colors, the transmission characteristic, and the generation and processing of color display signals. For example, NTSC signals are processed according to the degree of chromaticity of SMPTE 170M, and ATSC signals are not processed according to the degree of chromaticity of ITU-R BT.709 (1990). In addition, a method that makes a broadcaster designate the degree of input chromaticity for a television receiver to be able to combine other degrees of chromaticity is provided to ISO/IEC 13818-20.

In consideration of the difference in the degree of chromaticity between different signals, it is desirable to design a television receiver circuit having a compensation characteristic of the degree of chromaticity so that the video display of signals from various signal sources has a uniform degree of chromaticity. This television receiver circuit similarly compensates the hue for

similar objects, regardless of the specific degree of chromaticity, by compensating input video signals. For example, a flesh tone from an ATSC signal source can appear similar to a flesh tone from an NTSC signal source.

Moreover, the television receiver provides information and generates and displays an OSD graphic to enable a user interface function. Usually, an OSD is generated in response to a user input and provides information on a program or television receiver and can make a user control functions such as channel selection and image quality. The OSD system usually includes a common signal source for OSD signals, and these OSD signals are generated by a processing unit in response to a received signal or user input, stored in a memory, read out, and combined with video signals being received. The aforementioned signals are combined after the degree of chromaticity is compensated for the video signals. The aforementioned OSD signals are combined with the video signals in a mixer that is controlled by a microprocessor. As scanning lines of images are scanned on a CRT or similar display device, the aforementioned microprocessor selects an OSD signal or video signal, outputs it in response to the output of a counter, and selectively inserts an OSD image into a video program image.

However, it may be desirable to combine the OSD signals with the video signals prior to the compensation for the degree of chromaticity. The combination of the OSD signals and the video signals before the compensation for the degree of chromaticity can reduce the memory required and the processing delay. From such a viewpoint, in case the compensation for the degree of chromaticity is applied to the combined signals including video programs and OSD signals, the OSD hue can be changed. The degree of chromaticity of the OSD graphic can thus be substantially changed from one video signal source to another signal source. Therefore, it is also desirable to combine OSD signals with video signals by a method that provides a uniform hue output of OSD images, regardless of signal sources, prior to the compensation for the degree of chromaticity.

Detailed explanation of the invention

The present invention provides a device and method for combining OSD signals with program signals before compensation for the degree of chromaticity. In particular, the present invention provides a device and method for combining OSD signals and video program signals before compensation for the degree of chromaticity by a uniform method, regardless of signal sources, for a displayed OSD hue.

As one characteristic of the present invention, an OSD palette is provided, and an OSD unit connected to a display processor is included. The output of the display processor is combined with one of several matrixes to compensate the degree of chromaticity. The output of

the selected matrix, for example, is combined with a display unit such as a CRT and flat display, providing an output image.

As another characteristic of the present invention, an OSD unit equipped with several OSD palettes is included, and each of the aforementioned several OSD palettes has OSD data stored with a specific format of the degree of chromaticity and is related to one of several signal sources. A display processor responds to the selection of a specific signal source through a switch and is connected with one palette selected from the OSD palettes. With this method, the degree of chromaticity of OSD signals is adjusted so that it is matched with the degree of chromaticity of video program signals from the selected signal source. The output of the display processor is connected to one of several matrixes and provides the compensation of the degree of chromaticity. The output of the aforementioned selected matrix is connected to the display unit.

In addition, as another characteristic of the present invention, the present invention includes an OSD unit provided with an OSD palette and several OSD matrixes, and each of the aforementioned several OSD matrixes is suitable for providing a specific degree of chromaticity and related to one signal source among several signal sources. The aforementioned OSD palette responds to the selection of a specific signal source connected to one matrix selected from the aforementioned OSD matrixes. With this method, the degree of chromaticity of OSD signals is adjusted so that it is matched with the degree of chromaticity of video program signals from the selected signal source. The output of the selected OSD matrix is connected with the display processor, and the OSD signals are combined with the video program signals. Next, the output of the display processor is combined with one matrix selected from several matrixes through a switch, compensating the degree of chromaticity. The output of the aforementioned matrix selected is connected with the display unit.

Therefore, according to the present invention, the degree of chromaticity of the OSD signals is matched with the degree of chromaticity of the video signals, and the aforementioned OSD signals are combined with the aforementioned video program signals before the matrix arithmetic of the aforementioned combined signals, providing a uniform OSD hue on the display, regardless of the signal sources.

Next, the characteristics of the present invention will be explained in detail with reference to the attached figures.

<u>Brief description of the figures</u>

Figure 1 is a block diagram showing an OSD system in which OSD signals are combined with video signals before compensation for the degree of chromaticity.

Figure 2 is a block diagram showing an OSD system in which OSD signals are combined with video program signals by a method that provides a uniform degree of chromaticity, regardless of signal sources.

Figure 3 is a block diagram showing another application example of an OSD system in which OSD signals are combined with video program signals by a method that provides a uniform degree of chromaticity, regardless of signal sources.

Application examples

For better understanding of the present invention, the same reference symbols are given to the same constitutional elements that are commonly used through all figures.

Figure 1 is an outlined block diagram showing a video signal processing device (100) of the present invention. Since the constitutional elements of this video signal processing device (100) are well-known items to a person skilled in the art, their detailed explanation is omitted in this specification.

The video signal processing device (100) includes an NTSC chroma decoder (104) for receiving NTSC signals through an input stage (150). The aforementioned NTSC signals are received, demodulated, and connected to the NTSC chroma decoder (104) by a conventional well-known method. The NTSC chroma decoder (104) provides a luminance signal (Y) and two color difference signals (I, Q). These color difference signals (I, Q) include an R-Y component and a B-Y component of different sizes, and the signals are shown on orthogonal axes rotated by 33° counterclockwise relative to the R-Y axis and B-Y axis.

The analog output signals (Y, I, Q) are supplied to a digitizer (106) for providing a digital display of signals that are designated by Y, P_I, and P_Q. The aforementioned digital display is connected to a first terminal of a switch (122). The switch (122) is controlled by a microprocessor (165) for controlling the entire operation of the device similarly to several other switches shown in the figure for connecting various kinds of programs or OSD signals to each process or matrix. The microprocessor (165) can include one optional device among several control devices well known to a person skilled in the art to control various kinds of elements of the device. In addition, although a single microprocessor is described in the present invention, any person skilled in the art can understand that the microprocessor (165) can include several exclusive devices, that is, a memory controller, microprocessor interface unit, etc., to control specific functions.

The digital video signals are connected to a digital video decoder (108) through an input stage (151). The digital image decoder provides output signals (Y, P_R, P_B), and these output signals are connected to a second input of the switch (122). The color difference signals (P_R, P_B) include an R-Y signal and a B-Y signal that are changed by a conversion factor (scale factor) .

The output of the switch (122) is connected to a display processor (110), and this display processor includes a buffer memory for maintaining video data and/or combined video and OSD data that are read out. The video data stored in the display processor (110) are controlled by the microprocessor (165).

The aforementioned OSD signals are generated by using an OSD palette (102), and this OSD palette includes a display of OSD signals with a Y, P_R, and P_B format. The OSD palette (102) can be applied in a software pattern, and a specific bit sequence is related to a specific hue. On the basis of the hue information in the OSD palette (102), the microprocessor (165) generates an OSD bit stream and transfers the generated OSD bit stream to the display processor (110). The generated OSD bit stream is combined with video program signals based on a desired position of the OSD image on an output image. Therefore, the memory of the display processor (110) includes a bit map type display of output signals, and the aforementioned map type display includes video program images combined with the OSD image.

In case a display of a bit map type image stored in the display processor (110) is requested, the stored bit stream corresponding to the aforementioned image is read out by one of matrices (112, 114) through a switch (124). The microprocessor (165) controls the switch (124) so that the output of the display processor (110) is connected to the input stage of the matrix (114) if the input signal is an analog signal, whereas the output of the display processor (110) is connected to the input stage of the matrix (112) if the input signal is a digital signal. The matrices (112, 114) are operated by a conventional well-known method to provide RGB output signals in response to the input signal. With the selection of one appropriate matrix of the matrices (112, 114), the selected input signal is provided for processing of a specific degree of chromaticity to be able to provide a display with a uniform degree of chromaticity, regardless of the selected input signal.

A switch (126) connects the output of the selected matrix to the input of a display controller (116). The display controller (116) usually includes a circuit for controlling an output image in response to the user input control, like luminance and contrast. The output of the display controller (116) is connected to a display device (120) including a CRT, flat display, etc.

In the video signal processing device (100), the OSD signals are connected to the display processor (110) before being connected to the matrices (112, 114), and the display processor (110) converts the input signals into an RGB format. This process is distinctly different from that of a device of the prior art. Here, the OSD signals are combined with video program signals in a mixer arranged downstream of the display controller (116).

However, the video signal processing device (100) does not match the degree of chromaticity of the OSD signals in response to a selected signal source. This may cause an undesirable hue change in the hue of the OSD in accordance with the selected signal source. In

other words, the OSD hue changes with the change in compensation for the degree of chromaticity. In order to prevent this change, it is desirable to change the OSD hue to complement the compensation provided to the video program signals.

Figure 2 shows a second application example of the present invention. Here, the OSD hue is changed to complement the processing of the degree of chromaticity provided to the combined video signals. A device (200) includes OSD palettes (103, 105). The OSD palette (103) provides output signals with a Y, P_R, and P_B format, and the OSD palette (105) provides output signals with a Y, P_I, and P_Q format. In this operation, when an analog input signal is selected through a signal source (150), the OSD palette (105) is connected to a display processor (110), and when a digital input signal is selected through a signal source (151), the OSD palette (103) is connected to the display processor (110). One desired palette of the aforementioned OSD palettes (103, 105) is selected by a switch (140), and this selection is controlled by a microprocessor (165).

If an analog signal is received in the device (200) through the signal source (150), a switch (122) is connected to the digitizer (106), the switch (140) is connected to the output stage of the OSD palette (105), a switch (124) is connected to a matrix (114), and a switch (126) is connected to matrix (114). With this method, all of the input signals and the OSD undergo a Y, P_I, and P_Q format, matching the degree of chromaticity.

Similarly if a digital signal is received in the device (200) through the signal source (151), a switch (122) is connected to the outage of the digital video decoder (108), the switch (140) is connected to the output stage of the OSD palette (103), the switch (124) is connected to a matrix (112), and the switch (126) is connected to the matrix (112). Here, all of the input signals and the OSD signals undergo a Y, P_R, and P_B format, re-matching the degree of chromaticity. As a result, the hue of OSD is uniformly maintained, regardless of the input of an input signal from any of the signal sources (150, 151).

Figure 3 shows another application example of the present invention. Here, the OSD hue is changed to complement the compensation for the degree of chromaticity provided to video program signals. In a device (300), an OSD palette (125) is connected to a display processor (110) through a matrix (107) or matrix (109). In this case, the OSD palette (125) stores OSD information in an RGB format. The matrix (107) is exerted on OSD signals from the OSD palette (125) and provides Y, P_R, and P_B format signals. The matrix (109) is exerted on OSD signals and provides Y, P_I, and P_Q format signals. The outputs of the matrices (107, 109) are connected to the display processor (110) through a switch (140), and the display processor (110) is controlled by a microprocessor (165).

When a signal source (150) is selected, Y, P_I, and P_Q signals are provided to the display processor (110), so that a switch (122) is connected to the output stage of a digitizer (106), a switch (142) is connected to the input stage of the matrix (109), a switch (140) is connected to

the output stage of the matrix (109), a switch (124) is connected to a matrix (114), and a switch (126) is connected to the matrix (114). With this method, all of the input signals and the OSD signals undergo a Y, P_I, and P_Q formatting, matching the degree of chromaticity.

Similarly, when a signal source (151) is selected, Y, P_R, and P_B signals are provided to the display processor (110), so that the switch (122) is connected to the output stage of a decoder (108), the switch (142) is connected to the input stage of the matrix (107), the switch (140) is connected to the output stage of the matrix (107), the switch (124) is connected to a matrix (112), and the switch (126) is connected to the matrix (112). Here, all of the input signals and the OSD signals undergo a Y, P_R, and P_B formatting, re-matching the degree of chromaticity. Since the degree of chromaticity of the OSD signals is matched with the degree of chromaticity of the input video signals, regardless of the signal sources, the hue of the OSD is uniformly maintained, regardless of whether the input signal is an analog signal or a digital signal.

Although the present invention has been explained by illustrative application examples, any person skilled in the art can understand that the present invention can be variously modified and changed in a range where deviation from the technical concept of the present invention does not occur. For example, any person skilled in the art can understand that various kinds of elements, which are operated in response to video or OSD signals, as well as switches for connecting signals from one constitutional element to other constitutional elements can be realized in a hardware pattern or software pattern. Therefore, it can be understood that the present invention is presented so that it covers all modifications within the technical concept and range of the present invention.

Claims

1. A video signal processing device, wherein a first video signal source (150) for providing a first video signal with a first hue format, a second video signal source (151) for providing a second video signal with a second hue format, OSD signal generation means (103, 105, 165) that are equipped with various color palettes each having hue information in a specific hue format and generate on-screen display (OSD) signals having one hue format among several hue formats, and a means for combining said OSD signals (110, 140) with one video signal selected from said first and second video signals are included; and said OSD signal generation means provide said OSD signals with a hue format corresponding to the hue format of one video signal selected from said first and second video signals.

2. The video signal processing device cited in Claim 1, wherein one of said several color palettes (103) includes hue information of a Y, P_R, and P_B format.

3. The video signal processing device cited in Claim 1, wherein one of said several color palettes (105) includes hue information of a Y, P_I, and P_Q format.

4. The video signal processing device cited in Claim 1, wherein said first video signal is an analog television signal.

5. The video signal processing device cited in Claim 1, wherein said second video signal is a digital television signal.

6. The video signal processing device cited in Claim 1, wherein said OSD generation means includes a single color palette (125) containing hue information of a fourth hue format; and several hue conversion matrices (107, 109) suitable for selective connection to said single color palette.

7. The video signal processing device cited in Claim 6, wherein said first hue format is an RGB format.

8. The video signal processing device cited in Claim 6, wherein said conversion matrix (107) converts said first hue format into a Y, P_R, and P_B format.

9. The video signal processing device cited in Claim 6, wherein said conversion matrix (109) converts said first hue format into a Y, P_I, and P_Q format.

10. A graphic generation method for generating a graphic with a hue format that matches the hue format of received signals, wherein a step of identifying the pattern of signal sources (150, 151) related to the received signals, a step of selecting the color palettes (103, 105) having a hue format that matches the format of said received signals, a step of generating graphic signals (Y, P_R, P_B;Y, P_I, P_Q) in response to said selected color palette, a step of combining said graphic signals with said received signals, and a step of generating output signals (RGB) by processing said combined signals are included.

11. The graphic generation method cited in Claim 10, wherein a step of generating said selected color palette by converting a single color palette into several color palettes through several hue conversion matrices is further included.

12. The graphic generation method cited in Claim 11, wherein a said hue conversion matrix converts RGB format signals into Y, P_R, P_B format signals.

13. The graphic generation method cited in Claim 11, wherein a said hue conversion matrix converts RGB format signals into Y, P_I, P_Q format signals.

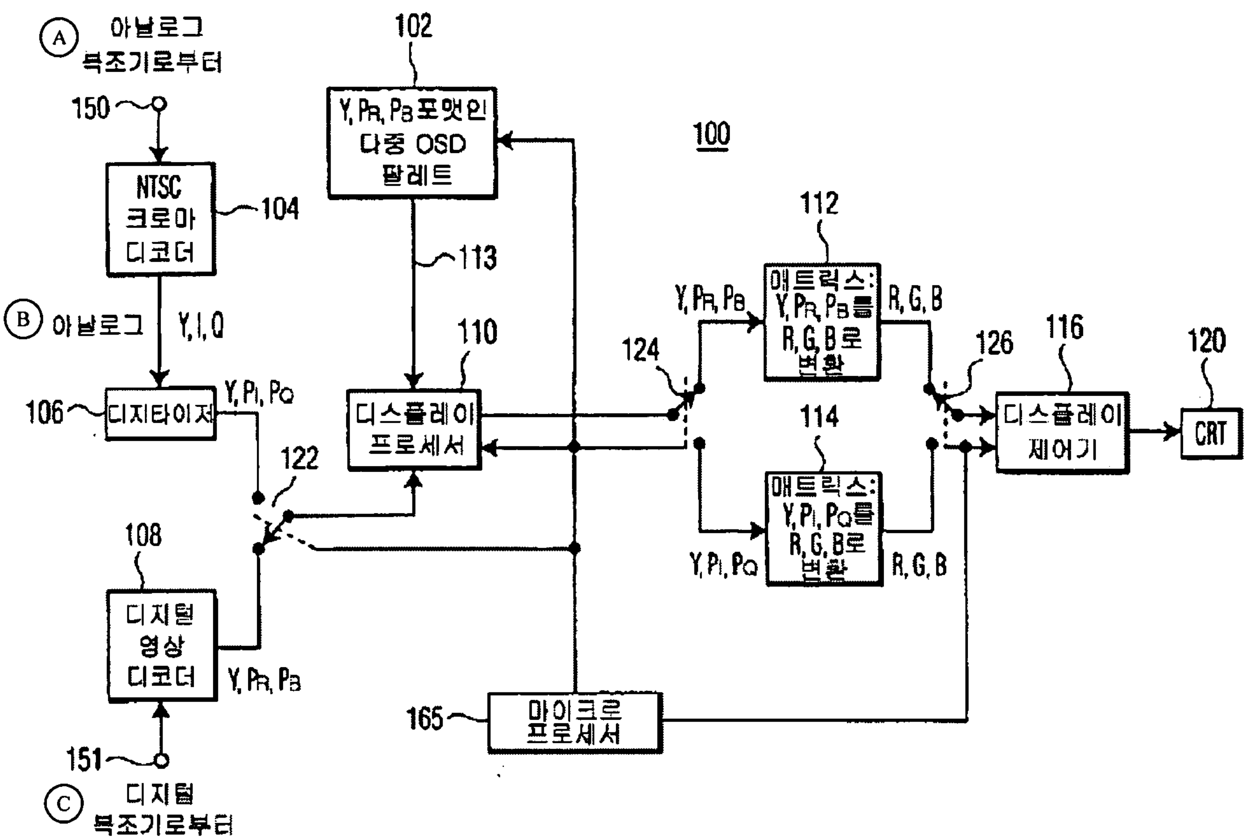

Figure 1

Key:	A	From an analog demodulator
	B	Analog
	C	From a digital demodulator
	102	Multiple OSD palette as a Y, P_R, P_B format
	104	NTSC chroma decoder
	106	Digitizer
	108	Digital video decoder
	110	Display processor
	112	Conversiòn of a matrix Y, P_R, P_B into R, G, B
	114	Conversion of a matrix Y, P_I, P_Q into R, G, B
	116	Display controller
	165	Microprocessor

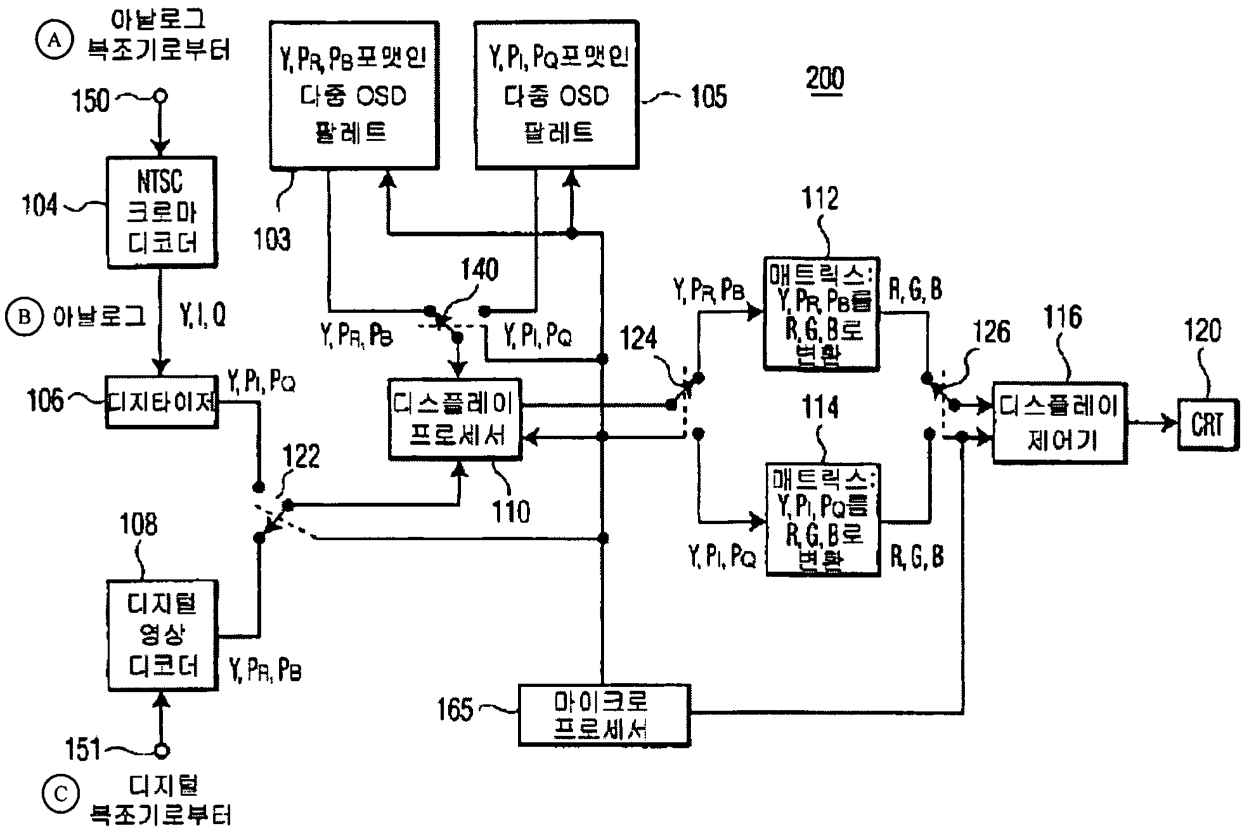

Figure 2

Key:

Key:	A	From an analog demodulator
	B	Analog
	C	From a digital demodulator
	103	Multiple OSD palette as a Y, P_R, P_B format
	104	NTSC chroma decoder
	105	Multiple OSD palette as a Y, P_I, P_Q format
	106	Digitizer
	108	Digital video decoder
	110	Display processor
	112	Conversion of a matrix Y, P_R, P_B into R, G, B
	114	Conversion of a matrix Y, P_I, P_Q into R, G, B
	116	Display controller
	165	Microprocessor

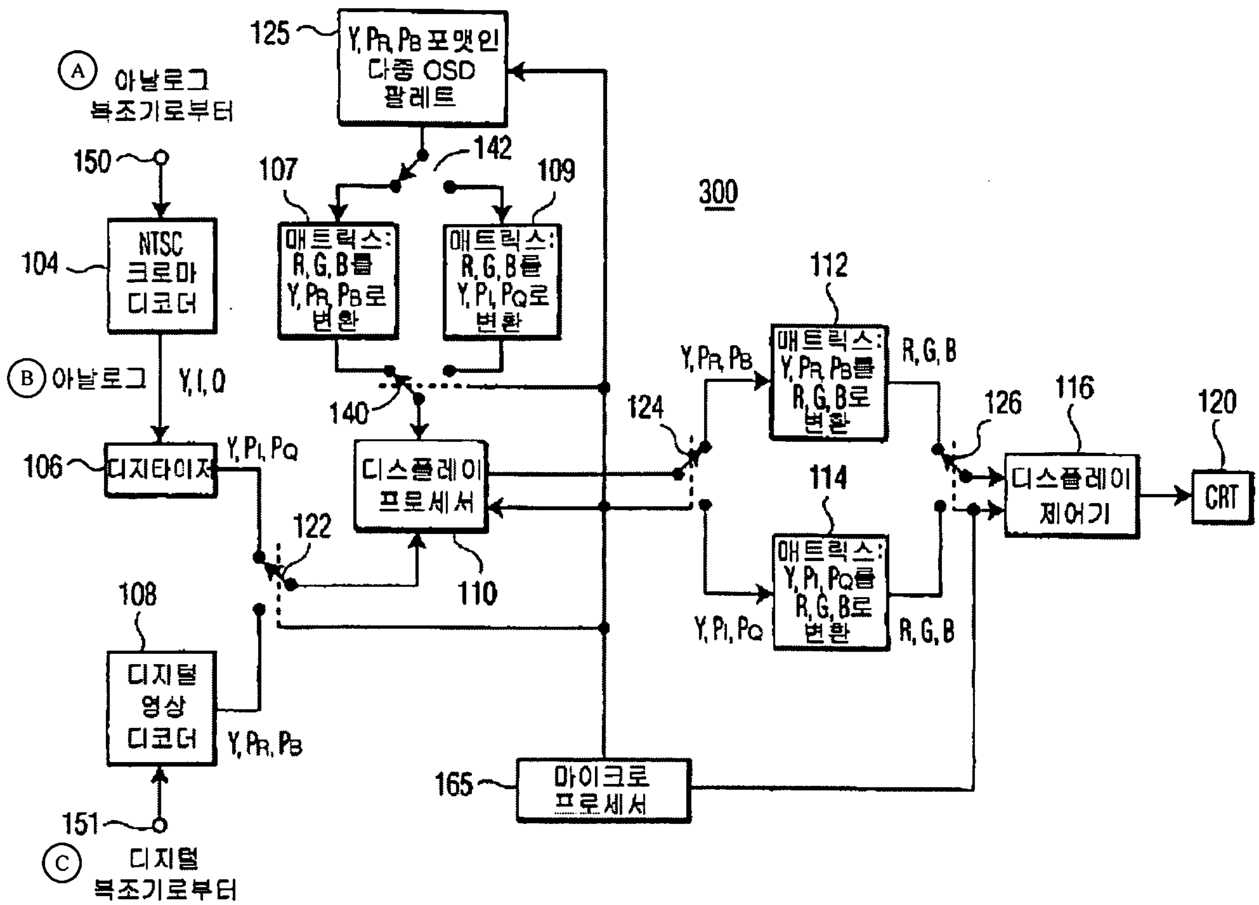

Figure 3

Key:		
	A	From an analog demodulator
	B	Analog
	C	From a digital demodulator
	104	NTSC chroma decoder
	106	Digitizer
	107	Conversion of a matrix Y, P_R, P_B into R, G, B
	108	Digital video decoder
	109	Conversion of a matrix Y, P_I, P_Q into R, G, B
	110	Display processor
	112	Conversion of a matrix Y, P_R, P_B into R, G, B
	114	Conversion of a matrix Y, P_I, P_Q into R, G, B
	116	Display controller
	125	Multiple OSD palette as a Y, P_R, P_B format
	165	Microprocessor